

DRAFT

CERN/DG/Research Board 2009-407

Minutes-189

8 October 2009

ORGANISATION EUROPEENNE POUR LA RECHERCHE NUCLEAIRE
CERN EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

CERN RESEARCH BOARD

**MINUTES OF THE 189th MEETING OF THE RESEARCH BOARD
HELD ON WEDNESDAY 2 SEPTEMBER 2009**

Present S. Bertolucci (Chairperson), P. Bloch, F. Bordry, H. Breuker, P. Butler,
P. Collier, M. Ferro-Luzzi, R. Forty (Secretary), E. Heijne, F. Hemmer,
A. Herlert, S. Myers, E. Rondio, E. Tsesmelis, C. Vallée (by telephone),
V. Vuillemin, T. Wyatt

Invited T. Eriksson, Y. Kadi (for item 1)

Apologies L. Alvarez-Gaume, R. Heuer

Items

1. Procedure
2. Report from the LHCC meeting of 8-9 July 2009
3. Report from the SPSC meeting of 30 June-1 July 2009
4. Any other business



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1. PROCEDURE

- 1.1 S. Bertolucci chaired the meeting, as R. Heuer could not attend. The **minutes** of the last meeting [1] were approved without modification. A number of matters arising from the minutes were discussed, listed in the following paragraphs.
- 1.2 The plans for the **LHC start-up** were discussed by S. Bertolucci and S. Myers. Initial collisions at an energy of 450 GeV/beam are expected by the end of this year, followed by a ramp up to 3.5 TeV/beam. That energy has been chosen to provide safe operation as experience is gained with the machine, while also allowing some interesting physics to be addressed. It is expected that the energy will then be increased, towards 5 TeV/beam, later on in the run. The interventions required to reach the design energy of 7 TeV/beam are under study, but the decision on their implementation will only follow once experience has been gained from the first run.
- 1.3 E. Rondio presented the new committee, the **REC**, which has been set up for the review of Recognized Experiments at CERN [2]. The committee will define the general conditions for the granting of Recognized Experiment status. As well as considering new requests, it will review the status of all presently recognized experiments and decide whether to extend the recognition for an additional period. The committee will make its recommendations to the Research Board for approval. **The Research Board approved the formation of the Recognized Experiments Committee.**
- 1.4 S. Bertolucci discussed the conclusions from the **workshop on new opportunities in the physics landscape at CERN** that was held on 11-13 May [2, 3]. The workshop was considered to be a starting point to assess new ideas for unique experiments, which might be performed at CERN, outside the LHC programme. There was a large interest from the community, and summaries from the session conveners are now attached to the workshop website. Other workshops are foreseen, including one on future neutrino physics that will be held at CERN on 1-3 October. S. Bertolucci concluded that there are many interesting ideas to follow up, and this should follow the traditional procedure of consideration of letters of intent and proposals by the relevant scientific committees. P. Collier commented that even the study of new ideas for the accelerator chain requires resources, and S. Bertolucci responded that a balanced

approach should be pursued: depending on the requests that are prompted by the workshop, there may need to be prioritization from the CERN management. C. Vallée stressed that coordination between the management and the scientific committees will be important, in particular concerning any substantial new initiatives.

- 1.5 Y. Kadi presented the status of plans for the upgrade of the ISOLDE facility, known as **HIE-ISOLDE** [2]. The present focus is on an upgrade of the REX post-acceleration facility, to make available a higher final energy of 10 MeV/nucleon. To cope with the limited available resources, it is proposed to delay until 2012 the design study of modifications to the target and front-end part of ISOLDE to profit from upgrades of the CERN proton injectors. The resources required for the proposed upgrade were discussed, some fraction of which are available from the ISOLDE collaborating institutes outside CERN, but less than had been expected. **The decision on approval was deferred until the Director General could be consulted, and will be communicated by the directorate.**
- 1.6 T. Eriksson presented the status of plans for the delivery of beam to the AEGIS (AD-6) experiment at the AD [2]. This was in response to a point that had been raised concerning the impact of AEGIS approval on the resources required for the consolidation of the AD machine, listed under item 1.3 in the minutes of the meeting held on 4 March [4]. The costs were clarified, and **the Research Board confirmed the approval of AEGIS.**
- 1.7 H. Breuker reported on the progress of the ongoing fixed-target physics run [2]. The running efficiency of the accelerator chain including the AD, PS and SPS has been excellent, and the experiments have made good use of the beam.

2. REPORT FROM THE LHCC MEETING OF 8-9 JULY 2009

- 2.1 T. Wyatt reported on the latest meeting of the LHCC, including mini-reviews of ATLAS and LHCb, and a joint session with CMS and TOTEM [2]. A Technical Design Report has been received from MoEDAL, but will be considered at the next meeting. In summary the four large LHC experiments have essentially achieved their aims for the shutdown and are now ready and waiting for first beam.

- 2.2 T. Wyatt also discussed the mini-review that had taken place of the experiments' computing resource needs. These have been re-evaluated by the experiments in light of the new machine schedule, and experience gained in analyzing cosmic-ray data. In general, higher resources are requested (per triggered event). There are large uncertainties in the estimates, but the available computing resources should not be a dominant factor in limiting the physics output from the first LHC runs. The LHCC therefore in general supports the requests, while recognizing that in the longer term there may be scope for savings. **The Research Board took note.**

3. REPORT FROM THE SPSC MEETING OF 30 JUNE-1 JULY 2009

- 3.1 C. Vallée reported on the latest meeting of the SPSC, including annual reviews of OPERA, ICARUS and COMPASS [2]. The CNGS experiments have recovered well from the recent earthquake; the ICARUS detector is now complete, while OPERA has successfully continued taking data. The committee looks forward to further understanding of the reconstruction efficiencies of OPERA, and optimization of their data analysis chain. **The Research Board took note.**
- 3.2 A proposal has been received by the SPSC for a new experiment at the AD named PAX, to measure spin-dependent proton-antiproton cross sections and provide input to models for polarisation build up. The committee has requested complementary information from the collaboration and is continuing its evaluation of the proposal.
- 3.3 The COMPASS collaboration has submitted an addendum to their proposal, requesting a further two years of muon beam data on polarised proton targets [5]. **The Research Board approved the extension of the COMPASS experimental programme with two further years of muon beam, and endorses the recommendation from the SPSC that it should be completed in a timely manner, starting with the planned run with transversely polarised protons in 2010.**

4. ANY OTHER BUSINESS

- 4.1 The **next meeting** of the Research Board will be held on 2 December 2009. The meeting dates for 2010 were approved: 3 March, 2 June, 1 September and 1 December.
- 4.2 The major issues for the next Research Board meeting were discussed. They will include a report on the international context of the ISOLDE programme, and conclusions from the forthcoming workshop on future neutrino physics.

ENCLOSURES

1. Draft Minutes of the 98th LHCC meeting held on 8-9 July 2009 (LHCC-2009-005/LHCC-098)
2. Draft Minutes of the 92nd SPSC meeting held on 30 June-1 July 2009 (SPSC-2009-024/SPSC-092)

REFERENCES

- [1] Minutes of the 188th meeting of the Research Board (CERN/DG/RB 2009-404/M-188).
- [2] Copies of the transparencies are attached to the agenda:
<http://indico.cern.ch/conferenceDisplay.py?confId=66290>
- [3] Workshop on New Opportunities in the Physics Landscape at CERN (CERN-DG-RB-2009-406/G-003).
- [4] Minutes of the 187th meeting of the Research Board (CERN/DG/RB 2009-402/M-187).
- [5] Addendum 2 to the COMPASS Proposal (SPSC-2009-025: (SPSC-M-769) SPSLC-P-297 Add.2).

CERN/LHCC 2009-010
LHCC 98
9 July 2009

LARGE HADRON COLLIDER COMMITTEE

Minutes of the ninety-eighth meeting held on
Wednesday and Thursday, 8-9 July 2009

OPEN SESSION

1. LHC Status Report: Steve Myers
2. TOTEM Status Report: Ernst Radermacher
3. MoEDAL Technical Design Report: James Pinfold

CLOSED SESSION:

Present: F. Bedeschi, S. Bertolucci*, G. Blazey, P. Bloch, C. Cecchi, M. Ferro-Luzzi*,
J.-F. Grivaz, C. Hawkes, R. Heuer*, J. Knobloch*, M. Mangano,
M. Martinez-Perez, P. Mato, A. Nomerotski, B. Panzer*, D. Pitzl, S. Smith,
E. Tsismelis (Scientific Secretary), T. Wyatt (Chairman), R. Yoshida

*part-time

Apologies: H. Breuker, M. Gonin

1. PROCEDURE

The minutes of the ninety-seventh LHCC meeting (LHCC 2009-003 / LHCC 97) were approved.

2. REPORT FROM THE DIRECTOR-GENERAL

The Director-General reported on issues related to the LHC.

Repair of the LHC machine has made tremendous progress. The problem with the copper junctions continues to be investigated. Sector 4-5 is being warmed to room temperature. The sector was previously warmed to 80 K in order to perform a test on the copper component of the busbars at non-superconducting temperatures. During the test at 80 K one busbar with potentially high resistance was found. The sector is now being warmed to room temperature to perform a more accurate test on all the copper busbars. By comparing the results of the two tests (80 K and 300 K), the accuracy of the 80 K test can be verified to help interpret data taken from the other cold sectors. The decision on the LHC schedule and energy will be made by taking into account the positions of the experiments at a specially-convened meeting to be held in August 2009. A run at a beam energy of 5 TeV will be kept if it is shown that dumping the magnet's stored energy faster is safe. Alternatively, running at a beam energy of less than 5 TeV is also being considered. The target for the first proton physics run includes the accumulation of 250 pb⁻¹ of good data with a heavy-ion run to follow.

The June Council Week was very successful. Council approved the Organization's Medium Term Plan and with it already the budget for the financial year 2010 and the strategy for the

LHC machine Phase I upgrade. Moreover, Council discussed funding for the consolidation projects for the LHC and the general infrastructure. An analysis of the risks will be undertaken in September 2009 from which a ranking of importance and urgency will be produced.

The Director-General also reported on the LHC computing. Discussions are on-going for an enhancement to the Tier-0 centre at CERN and an LHC physics centre at CERN is being studied.

3. REPORT FROM THE ALICE REFEREES

The LHCC heard a report from the ALICE referees, concentrating on the status of the experiment and the work scheduled for the LHC shut-down period.

The Committee heard a report on the status of the experiment. Modification of the Miniframe has been completed successfully; the small number of faulty high-voltage capacitors on the Time Projection Chamber (TPC) have been replaced; additional modules of the Transition Radiation Detector (TRD) have been installed, thus bringing the number of modules installed to six out of a total of 18; discharge problems on the Photon Multiplicity Detector (PMD) are now resolved and the detector is ready for installation; four Supermodules of the Electromagnetic Calorimeter (EMCAL) are ready to be installed on schedule in July 2009; and the Muon Detector has been completed. Most of the ALICE sub-systems are ready for tests with cosmic-rays. Good progress was reported on the ALICE DAQ and Detector Control System (DCS). On-going work during the current shut-down is related to the leakage current of the solenoid magnet; humidity control for the Photon Spectrometer and Inner Tracking System; after-pulsing on the V0 photomultipliers; frequent failures of Wiener power supplies and ventilation racks; and the DCS communication with the primary service providers. The ALICE experiment is expected to be ready for first LHC beam later in 2009.

4. REPORT FROM THE CMS REFEREES

The LHCC heard a report from the CMS referees, concentrating on the status of the experiment and the commissioning activities.

The referees reported on the status of the CMS experiment. All goals for the 2008-2009 shutdown period have been met on schedule. With the successful completion of the Preshower detector in April 2009, the CMS low-luminosity detector is ready. All significant issues have been understood and solved. This includes completion of the Tracker cooling plant renovation, with the Tracker now operational again; understanding of the CMS solenoid magnet fringe field with the new magnetic field model giving good agreement between data and simulation; the dark current of the Resistive Plate Chambers (RPCs) is stable; new procedures and tooling to reduce risks and time in opening and closing the CMS detector have been produced; and the field-sensitive Hybrid Photon Detectors (HPDs) of the Hadron Calorimeter have been replaced. As scheduled, the CMS detector is closed for a 4 T CRAFT cosmic-ray test starting on 23 July 2009. The CMS solenoid magnet has been cooled down to its nominal operating temperature. CMS will be ready for LHC beam following the completion of the CRAFT in early September 2009. The CMS software, computing, calibrations and readiness for physics are all in extraordinary good shape.

The LHCC also heard a report on the status of the TOTEM installation inside the CMS detector. CMS Technical Co-ordination and TOTEM are collaborating successfully on the TOTEM installation. CMS has made considerable contributions towards the design and installation of TOTEM elements, including the new re-designed T1 support truss and fixation blocks. The TOTEM T2 Telescope was installed successfully inside the CMS detector after

having passed the CMS ‘Ready-for-Installation’ review. The TOTEM T1 Telescope has missed the current installation window. TOTEM will need to complete one or both of the T1 Telescope rings and go through a CMS installation review prior to installation inside CMS on the next occasion that the CMS detector is open.

5. REPORT FROM THE TOTEM REFEREES

The TOTEM referees reported on the status of TOTEM as discussed in the numerous deliberations they have had with the TOTEM Collaboration since the February session of the LHCC.

The LHCC heard a report on the status of the TOTEM detectors. Good progress was reported on the Roman Pot detectors. Testing and installation of the remaining four silicon detectors is nearing completion. Commissioning of the full Roman Pot configuration will allow establishment of the complete system performance. The LHCC noted that the time remaining prior to the LHC re-start to establish a reliable Roman Pot system is tight and TOTEM should also plan around possible access limitations as the LHC begins preparations for beam. The referees also reported good progress on the T2 Telescope. The T2 Telescope is expected to be ready for first beam as its installation is complete inside the CMS Hadron Forward Calorimeter (HF) and commissioning is underway. The LHCC noted serious concerns for the T1 Telescope. The T1 Telescope is significantly behind schedule and long delays have been reported for both the chamber construction and in the design, production and delivery of the support structures. The T1 Telescope group is not well organised and suffers from a serious lack of manpower to complete the detector on time. The LHCC recommends that the TOTEM Collaboration implements project management procedures to produce a realistic resource-loaded schedule and that it brings in sufficient manpower to implement this schedule. In the meantime, the T1 Telescope group should continue with the construction, assembly and testing of the T1 Telescope until the first full ring operates reliably as a system, including the DAQ, Detector Control System (DCS) and Detector Safety System (DSS).

The LHCC heard a report on the TOTEM DAQ, DCS, software and database. Tools for the low-level local operation of the DAQ and DCS exist, and there are no tools yet available for the global operation of a single sub-detector. The database is not yet available to store TOTEM conditions data and the firmware developments for the DAQ module remains a concern. The LHCC urges the TOTEM Collaboration to develop the respective systems to be as compatible as possible with a later integration with the CMS system.

The referees also reported on the overall TOTEM experiment integration and readiness for running. The LHCC noted that there is no resource-loaded schedule to bring the full experiment into a global run mode. The online software and analysis tools are at an early stage and there is a concern that the group of physicists to operate the TOTEM experiment on a continuous basis during the run may be lacking.

For TOTEM to profit from the first LHC physics runs later in 2009, the LHCC recommends that the Collaboration get the Roman Pot system and the T2 Telescope ready for beam and also install and commission the control room, DAQ, computing and data distribution. TOTEM should integrate the above sub-systems to produce an initial working detector, except for the T1 Telescope. TOTEM should use the first LHC beams to complete their commissioning and to learn as much as possible about the proton

dynamics, in parallel, work should also continue on completing the two rings of the T1 Telescope, which are to be installed after consultation with CMS.

The LHCC also deliberated on the issue of integration of CMS and TOTEM. With the aim of a common physics programme after the first LHC physics run, the LHCC recommends that CMS and TOTEM re-establish the joint physics working group and work towards a Technical Design Report describing an integrated situation.

Although several issues of concern have been identified by the referees, much progress has been made in the past few months and the referees commend the TOTEM Collaboration for their constructive efforts and co-operation. In particular, the referees congratulate the teams of predominantly young physicists who have been driving the final stages of the completion and installation of the Roman Pot detectors and T2 Telescope.

6. REPORT FROM THE MoEDAL REFEREES

The LHCC heard a report from the MoEDAL referee on the Technical Design Report of the MoEDAL Experiment (LHCC-2009-006 / MoEDAL-TDR-001) submitted in June 2009.

MoEDAL is designed to search for highly-ionising particles at the LHC – monopoles/dyons as well as stable and pseudostable singly- and multiply-charged heavy stable particles. The MoEDAL detector is based on track-etch detectors and will be housed in the LHCb Vertex Locator (VELO) cavern at LHC Point 8. The MoEDAL Collaboration is ready to make a first test exposure of 1 m² of their detector during the coming year with the aim of a full exposure starting in 2011. An integrated luminosity of about 6 fb⁻¹ is requested. The LHCC is currently reviewing the Technical Design Report and, following further discussions between the LHCC referees and the MoEDAL Collaboration, a full report and recommendation will be made at the September 2009 session of the Committee.

7. REPORT FROM THE SPECIAL MINI-REVIEW ON EXPERIMENT COMPUTING RESOURCES

The LHCC has reviewed the scientific merit of the computing resources request presented by the experiments to the CRSG (Computing Resources Scrutiny Group) for 2009/2010.

In general, the experiments have revisited their computing needs in view of an LHC schedule that currently considers a relatively long run, presumably followed by a long shutdown. The experiments expressed their need for enhanced CPU and disk capacity at the CERN Analysis Facility (CAF) for calibration/alignment and validation purposes, and multiple fast reprocessing of data at Tier-1 centres, with the aim to provide expeditious feedback to the experimental halls. In some cases, the request also reflects better knowledge of the software performance compared to that anticipated in the original computing Technical Design Reports, as well as the experience accumulated by analysing cosmic-ray runs during the last months.

The LHCC finds the approach adopted by the experiments to be well motivated and sensible. Given the important investment made in the construction of the LHC and the detectors during many years, the physics outcome using the very first LHC data should be maximised and not limited by computing resources. The Committee also realises that current estimates for computing needs suffer from large uncertainties. The LHCC does not consider the crucial and long-awaited first year of LHC operations to be an appropriate time to attempt to cut back substantially on the procurement of computing resources. However, with better

knowledge and experience from the first year of operations, and with the possible need for a long LHC shutdown for machine consolidation, some potential savings in the computing budget may present themselves in the future.

The ATLAS and CMS experiments have recently achieved an average 80% success rate for job submission to Tier centres during the last STEP09 challenge, a co-ordinated effort by ALICE, ATLAS, CMS and LHCb for scale testing of the LHC computing. The LHCC is concerned by the fact that the average is biased downwards by the reduced output of few underperforming Tier sites, while resource usage at well-performing Tier centers exceeds 90% efficiency. The LHCC encourages the experiments to continue their work with the various sites to improve the average efficiency, and strongly recommends a second STEP09 exercise before LHC starts operations. The LHCC notes that close communication between service providers and consumers is an important factor at the successful Tier sites. Indeed, the local presence of experiment-specific expertise at Tier sites is also identified by the collaborations as an additional factor in success.

The LHCC considers that the disk, processor, and tape resource requested by the experiments permits the collaborations to store the data needed for understanding the detectors and processing the data on time scales appropriate for the initial LHC programme. The current request ensures the experiments have contingency with respect to uncertainties involving the machine schedule and operating parameters. In a scenario with limited funds, this request should be regarded as exceptional, and driven by the start-up of the LHC programme. Estimates based on figures from the computing Technical Design Reports correspond better to steady operations of each of the experiments as the LHC programme matures.

The Committee understands the need to ensure fast feedback from the Tier-0 first pass reconstruction and from CAF for calibration/alignment and detector performance studies. However, experiments should not devote these resources to performing any significant fraction of their physics analyses.

More specific comments on the separate requests by each experiment are made in a dedicated report (CERN-LHCC-2009-011/G-148).

8. REPORT FROM THE LHC PROGRAMME CO-ORDINATOR

The LHCC heard a report from the LHC Programme Co-ordinator. He focused on developments since the February 2009 session of the LHCC, the scenarios for increasing the LHC luminosity and intensity during the first physics run and the LHC schedule for the period 2009-2010. The repair and consolidation of the LHC has made excellent progress since the previous session of the LHCC. The target for the first proton physics run includes the accumulation of 250 pb^{-1} of good data at a 10 TeV centre-of-mass energy. This will allow the LHC experiments to start competing with the Tevatron Higgs searches for masses of around 160 GeV. A heavy-ion run will then follow. The top energy and duration of the first LHC physics run will be discussed in a joint meeting between the experiments and machine in mid-August 2009. In the meantime, the LHC technical issues and modalities of operation are being assessed by the machine groups. A series of LHC transfer line and injection tests are underway. A test of TI8 was successfully held on 6-7 June 2009. The beam was dumped on to the TED ‘beam stopper’ situated about 300 m. prior to the LHCb interaction point. The LHCb detector recorded tracks that are being used to time and space align sub-detectors. The TI2 test is scheduled for mid-July 2009, while a combined TI2 and TI8 test is scheduled for the end of August 2009.

9. REPORT FROM THE ATLAS MINI-REVIEW

The ATLAS Mini-review was held July 7, 2009 and encompassed ten talks. The mini-review covered the detector status and commissioning, results from the analysis of cosmic-ray data, trigger status and menu optimisation, software status and preparation for beams, computing status and preparation for beams, data preparation, progress on physics objects, analysis strategies and examples for 10 TeV centre-of-mass running, and the Phase I upgrade.

The ATLAS detector is fully prepared for the onset of collider data. All detector systems have more than 98% of their channels operational, except the muon Resistive Plate Chambers (RPCs) which will be completed this summer. The main concern at the moment involves failure of LAr optical transmitters at a rate of 0.1% per week; these failures are not yet understood and ATLAS is vigorously pursuing the matter. The firmware for the Cathode Strip Chamber (CSC) readout, which is not yet operational, is also a significant concern. The recent cosmic-ray run shows that the systems are operational and the detector aligned to expectations. Improved alignment will require collider data. The trigger is also ready; the Committee found it difficult to fully evaluate the trigger and commissioning strategy and additional material was provided to the Committee, and ATLAS was asked to provide a clear exposition for the next LHCC meeting. ATLAS was also urged to consider investigating the robustness of the DAQ with respect to unexpected fluctuations in data rate and to develop a plan to expeditiously, but prudently, introduce zero-suppression in the LAr readout.

The software for simulation and reconstruction is also ready for beam. The collaboration has mounted very encouraging campaigns for CPU, memory, and I/O optimisation and for software quality in general. The time needed for event simulation has increased significantly due to increased complexity of the geometry, evolution from a minimum bias sample to a high-momentum transfer sample, increased rapidity coverage for the forward calorimeter simulation, and a specific shower simulation. These factors have been offset somewhat by efforts to reduce CPU time. Nonetheless, to gauge analysis requirements, ATLAS was asked to provide a quantitative measure of the statistical significance required for the Monte Carlo samples in terms of physics signals.

The STEP09 exercise, a co-ordinated effort by ALICE, ATLAS, CMS and LHCb for scale testing of the LHC computing, was extremely useful, validating the general computing strategy and showing that simultaneous Monte Carlo production, reprocessing from tape, data distribution and analysis at high rate works well. To improve performance, ATLAS was urged to make site visits to those Tier-1 and Tier-2 centres that fell short of STEP09 benchmarks. The data quality, luminosity handling, and the calibration and alignment procedures are all operational.

ATLAS showed great progress on the reconstruction algorithm and analysis tool development. Results were shown for tracking, muon identification, flavor tagging, electron and photon identification, as well as jet identification, missing transverse energy calculation and tau identification. Tracking efficiency reaches 80% at 2 GeV with a 1% fake rate. Electron efficiency exceeds 90% for transverse momentum above 10 GeV as does muon efficiency for transverse momentum above 6 GeV. For a b-tagging efficiency of 60%, background rejection is 39. Alignment is also in good shape, which was not the case at the last meeting of the LHCC.

The initial physics strategy focuses on detector commissioning and Standard Model physics evolving towards a second phase involving searches. The Standard Model analysis will include minimum bias investigations and jet, J/ψ , and W/Z cross sections. Thereafter, top quark measurements and searches for a Z' and SUSY will emerge. For the next LHCC

meeting, ATLAS was asked to provide a detailed description of analysis preparations (triggers, data sets, efficiency measurements, etc.).

Work continues on the Insertable B Layer (IBL) for the ATLAS upgrade. Two layouts are under consideration each with 14 sensors either mounted singly on a stave or doubly on a “bi-stave”. Component R&D is well underway and includes sensors, front-end chips, and staves. Project organisation has been established and is based on four working groups: modules, staves, integration and installation, and off-detector electronics. Technical drawings for the reduced radius beam pipe should be completed by the end of 2009. ATLAS asked the LHCC to inform them, within three months, if the assumed installation date of the second half of 2014 was correct, as the date influences prototyping and planning. The Director of Research indicated that this was the most likely date for a long shutdown.

In conclusion, the LHCC considers that ATLAS has shown very good progress in detector, software and organization, and the experiment is in excellent shape for the start of the LHC physics programme.

10. REPORT FROM THE LHCb MINI-REVIEW

The LHCb detector is well prepared for the upcoming LHC data taking. The hardware status is very solid with the Collaboration taking advantage of the long shutdown to consolidate the detector in all areas. All subsystems are fully operational with a good channel count, exceeding 99% in all cases.

The LHCC noted excellent progress in all areas:

- The VELO vertex detector is fully operational and the construction of an identical replacement is progressing as planned.
- The Ring Image Cherenkov detectors (RICHs) are fully operational; the minor high voltage power supply instabilities have been understood and mitigated by replacement of a component. The main long-term issue with this detector is development of high ion currents in some Hybrid Photon Detectors (HPDs). It is expected that about 100 HPDs will need to be replaced in the next five years. The HPD refurbishment developed with the provider is progressing successfully. It is expected that some HPDs will still be missing in September 2009 but they will be available soon thereafter and can be readily installed later during a 48-hour access.
- The Silicon Tracker is 99% operational. The problem of broken bond wires has resurfaced with another module affected. More spares will be prepared when the problem is fully understood. The replacement can be done in a 24-hour access.
- Preventive procedures to minimise outgassing of glue that could potentially cause a gain loss in the Outer Tracker (OT) have been completed. The gas system has been modified to allow for additives that can further mitigate the problem.
- The Calorimeter noise issues have been resolved.
- The Muon System is fully operational after a major effort to complete the M1 installation and commissioning.
- The trigger and DAQ systems are ready for data. The High Level Trigger (HLT) has been partially upgraded and 80% is commissioned. The final CPU installation is expected in 2010, which optimizes expenses for more powerful 6-core processors.

- The shift organisation takes a minimal approach with a three person crew. All necessary experts will be available on call 24/7 and operational experience will guide the evolution of shift staffing.
- Organisation of the LHCb physics software is straightforward and effective with people identified for all the key tasks. Global reconstruction has been ready since Spring 2008 and has been shown to be stable with pile-up of up to three mean interactions per crossing. It has been used on cosmic-ray and TED beam stopper data in both 2008 and 2009, and good initial detector alignments have been achieved (OT $\sim 100\ \mu\text{m}$, Inner Tracker $\sim 30\ \mu\text{m}$, VELO $\sim 5\ \mu\text{m}$). Data quality control procedures have been tested using Monte Carlo events at 2 kHz.
- To test the offline stripping, 10^9 minimum bias Monte Carlo events are being generated, at 2×10^7 events/day, saturating available resources. A similar number of simulated events are requested for 2010. The referees understand the motivation for this, but ask that the number of events be further justified, since there should be ample LHC minimum bias data by then. The Committee also encourages LHCb to merge LHC minimum bias data with simulated signal events to estimate pile-up effects, since this has proved more reliable than full simulation at other hadron-collider experiments.
- LHCb also request increasing to 50% in 2009 (40% in 2010) the fraction of analysis work performed at CERN, motivated by the need for a fast response to detector studies during the first run, and to avoid possible early problems with use of the Grid. The referees agree that use of the CERN Analysis Facility (CAF) is appropriate and important to ensure a fast turnaround, in a phase of rapidly-changing operating conditions, but it should not be used simply for the development of physics analysis algorithms. The LHCC encourages LHCb to reach the anticipated 25% fraction of CERN-based analysis activity as soon as possible.
- Plans for early physics studies are well advanced. In Phase-1, the focus is technical runs to commission the L0 trigger, alignment and calibration, physics objects and streaming strategy. The LHCC noted that if the centre-of-mass energy is below 4 TeV, the VELO cannot be closed thus seriously degrading the acceptance. In Phase-2, with low luminosity ($\sim 20\ \text{pb}^{-1}$) at centre-of-mass energy above 4 TeV, the HLT can be deployed and reconstruction and analysis techniques commissioned. Some first physics with minimum bias and charm events is also possible. In Phase-3, with $100\text{--}200\ \text{pb}^{-1}$ at a centre-of-mass energy up to 10 TeV, meaningful studies will be performed in all the core B-physics analyses. In particular, the physics reach in $B_s \rightarrow \mu\mu$, and β_s from $B_s \rightarrow J/\psi\ \phi$, is expected to be similar to that foreseen at the Tevatron. The referees suggest also looking at expectations for B_s mixing as an important benchmark for flavor-tagging and vertex-resolution performance. LHCb requests the maximum possible integrated luminosity with centre-of-mass energy above 4 TeV in 2010.

In conclusion, the LHCC considers that LHCb has shown very good progress in detector, software and organisation, and the experiment is in excellent shape for the start of the LHC physics programme.

11. REFEREES

The LHCC referee teams are as follows:

ALICE: M. Gonin (Co-ordinator), W. Kuehn, J.-F. Grivaz

ATLAS: J. Blazey (Co-ordinator), C. Cecchi, P. Mato, D. Pitzl

CMS: E. Elsen, M. Martinez-Perez, S. Smith (Co-ordinator), R. Yoshida

LHCb: F. Bedeschi (Co-ordinator), C. Hawkes, A. Nomerotski

TOTEM, LHCf, MoEDAL: C. Cecchi, E. Elsen, M. Mangano, P. Mato

LCG: J.-F. Grivaz, C. Hawkes, M. Martinez-Perez (Co-ordinator)

Experiment Upgrades:

Co-ordinator: D. Pitzl

RD39: D. Pitzl

RD42: A. Nomerotski

RD50: A. Nomerotski, R. Yoshida

RD51: W. Kuehn

12. The LHCC received the following documents:

- Minutes of the 97th Meeting of the LHCC, held on 18-19 February 2009 (LHCC-2009-010 LHCC 97)
- LHCC TOTEM Mini-Review – 6 May 2009 (LHCC-2009-008/G-147)
- Technical Design Report of the MoEDAL Experiment (LHCC-2009-006/TDR-001)

13. DATES FOR LHCC MEETINGS

Dates for **2009**:

23-24 September

18-19 November – *now cancelled*

Dates for **2010**:

17-18 February

5-6 May

7-8 July

22-23 September

17-18 November

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CERN/SPSC-2009-024

SPSC-092

30 June – 01 July 2009

DRAFT MINUTES of the 92nd Meeting of the SPSC
Held on Tuesday and Wednesday June 30th and July 1st 2009

OPEN SESSION:

- | | |
|--|---------------|
| 1. OPERA | F. Terranova |
| 2. ICARUS | G. L. Raselli |
| 3. COMPASS i) Hadron programme | B. Ketzer |
| 4. COMPASS ii) Muon Programme & future plans | G. Mallot |
| 5. PAX Proposal | F. Rathmann |

CLOSED SESSION

Present:

S. Bertolucci, P. Bloch, B. Bloch-Devaux, H. Breuker, F. Close², M. Erdmann, A. Ereditato, L. Feld, E. Gallo, L. Gatignon, L. Garrido, P. Giubellino, S. Katsanevas¹, J. Knobloch, M. Mannelli (Secretary), P. Marage, S. Maury, P. Newman¹, E. Rondio, C. Touramanis, C. Vallée (Chairman), U. Wiedemann

Apologies: M. Charlton

¹) Present on Tuesday only²) Present on Wednesday only

1. MINUTES OF THE 91st MEETING OF THE SPSC

The Minutes of the meeting held on April 27 and were approved by the Committee (CERN-SPSC-2009-017 / SPSC-091).

2. REPORT FROM THE CHAIRMAN

The Chairman reported on the Research Board (RB) meeting, RB188. The following points were presented to the RB and, where necessary, discussed:

- 1) The SPSC presented the successful commissioning of the upgraded DIRAC experiment, and its timely publication of an observation of π -K atoms based on 2007 data.
- 2) The SPSC noted the progress of the NA63 experiment in its measurements, and its plans to complete the approved program in 2009.
- 3) The SPSC reported the results and lessons learned from operating the CLOUD 2006 prototype chamber, and the research program to be performed with the new chamber being now installed. The SPSC also acknowledged the progress made by the CLOUD Collaboration in formalising its management structure and publication rules, and reminded the potential impact on CERN image of the future publications of the experiment.
- 4) The SPSC summarized its investigations of the readiness of the DIRAC, COMPASS and CNGS experiments to make the best use of their requested data in 2009, and recommended that these experiments be delivered an integrated amount of beam as close as possible from their requests.

The Research Board noted points 1) and 2), and acknowledged point 3).

As regards point 4), the RB mentioned that the DIRAC and COMPASS experiments should get the expected beam in 2009, and that the foreseen integrated amount of Protons on Target for CNGS is $3.2 \cdot 10^{19}$ in 2009. Thanks to the use of parasitic beams, nTOF will be able to integrate $7.3 \cdot 10^{18}$ POTs, which seems acceptable for 2009.

The Research Board asked the SPSC to nominate one representative in the new Body set-up to review the status of recognized experiments.

5) Matters Arising

In response to the request from the RB for the time being, the SPSC will be represented by its Chair in the new Body dealing with Recognised Experiments at CERN.

3. STATUS OF ACCELERATORS

S. Maury reported on the status of the Accelerators.

After a good **PSB** start-up, the **Booster** has been delivering all user and MD beams with high availability and quality. A major technical problem in the period concerned is a water leak, which developed on the injection septum. This is 30 years old equipment, which had never before been opened or serviced. During the weekend of the 15th of May, low intensity beams could be delivered without water-cooling of the septum in order to minimize the impact on physics. On Monday the machine was stopped for a 24h radiation cool down imposed by RP. The intervention on the septum could be completed successfully on Tuesday. Following the intervention, a leak on the mechanism of view screens (in the septum tank) required opening the vacuum again. Once this was fixed, it was decided to re-start the Booster without bake-out during the weekend. The physics beams were available again as from Monday.

The **PS** machine has started as foreseen in the schedule and has delivered typical intensity to each user SFTPRO, AD, EAST beams, nTOF and CNGS.

The **SPS** started with beam on the 23rd of April and fixed target beam was available on all North targets on the 11th of May as foreseen in the schedule. Beam on the **CNGS** target was achieved for the 28th of May. After some initial problems with RF cavities a good production rate of 2 to 3 10^{17} protons per day was obtained. A first test with coasting beam for UA9 was performed week 26.

After the installation and realignment of the **AD** production target the anti-proton yield is back to normal values. After a start-up of 4 weeks the AD physics have started as foreseen in the schedule the 8th of June. Several problems appeared during the first 2 weeks of physics as mentioned by L. Gatignon in his report.

In conclusion, all the machines have been delivering all user and MD beams with high availability and quality. Further fine-tuning of the machines is ongoing.

4. STATUS OF EXPERIMENTAL AREAS

Lau Gatignon reported on the start-up on schedule of the East and North Areas.

In the **East Area** the T9 and T10 test beams, as well as the irradiation facility started on the 30th of April. The T9 beam was used very successfully for 7 weeks by T2K, followed by the Calice RPC group, whereas different Alice and Calice groups used T10. In the beginning of the run the alignment of some instrumentation at the end of the IRRAD beam line complicated slightly the setting up, but all was realigned correctly on the 25th of May. In spite of this, irradiations could take place as scheduled.

DIRAC started their setting up only on the 14th of May with one cycle per super cycle. Full data taking at nominal intensity started on the 8th of June without problems. Installation work for the CLOUD experiment, in particular for the gas system, continued in and around the T11 zone.

In the **North Area**, beams were available on request from the 10th of May onward, ahead of schedule. COMPASS profited from this early beam to already complete the commissioning of their apparatus and they also calibrated their electromagnetic calorimeter in situ with electron beams. A new hadron optics is being evaluated, which allows a significantly higher CEDAR kaon identification efficiency, but may lead to higher backgrounds in the experiment.

NA62 could successfully complete the tests of the RICH400 prototype in the K12 beam. At the time of the meeting the preparations of the October tests were starting. Also the NA61 and NA63 experiments had good beam conditions for their first short runs, although NA61 suffered from cooling circuit instabilities for their electronics. These are being worked on in preparation for the July/August run.

In addition to providing beam for these experiments, a large number of test beam users were served. Only the CMS/CASTOR test in the H2 beam line had to be rescheduled to a later date, as their whole period was lost due to Booster problems.

The **CNGS** start-up took place on the 1st of June only, following some delays for OPERA after the earthquake that hit the Gran Sasso region on April 6th. The intensity was rapidly increased from 2×10^{13} protons per CNGS cycle at the beginning to 4×10^{13} protons per cycle on the 4th of June. Since then the efficiency was good and the SPS supercycle was optimised for CNGS. The aim is to deliver 3.2×10^{19} a proton on the CNGS target in 2009, and so far the delivered intensity was on track.

After the installation and realignment of the **AD** production target the anti-proton yield is back to normal values. The AD started operation on schedule, but the operation during the first two weeks was hampered by several problems. The most severe was a water leak in the experimental area, which sprayed part of the ASACUSA apparatus and the ALPHA electronics. Several days were partly lost for these experiments, but at the time of the meeting both were running normally again.

5. PS, SPS AND AD SCHEDULES

H. Breuker gave the update of the user's schedules for PS, SPS and the AD.

The present version numbers are for the PS V3.0 and for the SPS V3.0, both released on the 5th of June 2009. The AD schedule is V1.0 released on the 4th of May 2009.

As reported last time the user schedule for the **SPS** had been compressed by one week in view of a possible delay of the start-up. As it turned out this delay could be avoided and start-up was on the 11th of May as in the original schedule. The users having been asked to be in stand by mode were ready to make use of the beams immediately and no time was lost.

At the **PS**, the DIRAC experiment started on the 14th of May, and nTOF was running on its new target commissioning as of the 18th of May.

The **AD** machine had an excellent start-up on the 8th of June and all experiments (ATRAP, ASACUSA and APLPHA) were ready for the beams. The AD facility suffered from several breakdowns later; it is back to smooth running conditions by now.

The irradiation facility at **T7** was operated throughout the first beam period. At the test beam facilities in **T9** and **T10** beam delivery to the users went as planned. The list of finished test

beam projects at PS and SPS is impressive already at this stage. At the SPS all of the experiments got started.

COMPASS has finished its ECAL calibration and is in physics mode for hadrons.

During June NA61 (SHINE) performed a test run, NA62 did its RICH detector calibration and NA63 had its first physics run in 2009. OPERA at CNGS was operational as from the 27th of May onwards. The switch over between the different users of the SPS test beams was also smooth. At the SPS the first successful test runs were performed for the UA9 experiment, which is testing beam collimation by use of crystals.

6. DISCUSSION OF THE OPEN SESSION

6.1 LNGS

The SPSC congratulates the LNGS and the OPERA and ICARUS Collaborations for their remarkable success in re-establishing operations with only minimal delays, in spite of the extremely difficult circumstances resulting from the April earthquake.

6.2 OPERA

The SPSC notes with pleasure the start of OPERA data taking in 2009. The SPSC looks forward to further understanding of the reconstruction efficiencies and optimization of the data analysis chain, as well results from the 2009 data.

6.3 ICARUS

The SPSC notes with pleasure the completion of the ICARUS detector and all associated cryogenic systems. **The SPSC also notes** the timely and successful resolution of the problems with the liquefier system, and the feed-through flanges.

The SPSC looks forward to a timely solution to the recently discovered problems with the external insulation.

6.4 COMPASS

The SPSC congratulates COMPASS for their successful hadron data taking in 2008, and efficient start-up for hadron data taking in 2009 with the upgraded detector. A number of distributions have been shown, which indicate that the data is of good quality. **The SPSC looks forward** to quantitative results from these data, **and notes** that results from the 2004 hadron pilot run are not yet published.

The SPSC notes with pleasure the progress in publishing muon beam data on the polarized deuterium target, and the preliminary analysis of the data on the polarised proton target from the full 2007 run.

The SPSC considers that there is a well-motivated case for the proposed muon beam data taking with both transversely and longitudinally polarised protons, and supports this program. **The SPSC recommends** approval of the proposed further COMPASS muon beam program,

and looks forward to its timely completion, starting with the planned transversely polarised protons run in 2010.

The SPSC notes plans from the COMPASS collaboration to submit specific proposals, following their recent submission of a Letter of Intent.

6.5 PAX Proposal

Following the Open Session presentation, and its first evaluation of the PAX Proposal, **the SPSC has requested complementary information** from the Collaboration **and is continuing its evaluation** of the proposal.

7. FOLLOW UP ON EXPERIMENTS AND PROPOSALS

7.1 NA62 – P326

The SPSC notes with pleasure, that new preliminary results for the measurement of R_K have been shown, which are in line with the expected precision.

8. DOCUMENTS RECEIVED

- Minutes of the 91st Meeting of the SPSC held on 16-17 April, 2009; CERN/SPSC-2009-017/ SPSC-091.
- CNGS1 – OPERA: Status Report, CERN-SPSC-2009-022 / SR-048.
- CNGS2 – ICARUS; Status Report, CERN-SPSC-2009-023 / SR-049.
- COMPASS - NA58: Status Report, CERN-SPSC-2009-021 / SR-047.
- Addendum 2 to proposal SPSLC-96-14, SPSLC-P-297: Muon programme and plans for the near future: CERN-SPSC-2009-025 / P-297 Add.2).
- Measurement of the Spin-Dependence of the $p\bar{p}$ -p Interaction at the AD Ring (PAX Collaboration); CERN-SPSC-2009-012 / P-337.

CERN Document Server (CDS):

<http://cdsweb.cern.ch/search?sc=1&p=SPSC+2009>